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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/047,610	01/16/2002	Carl P. Babcock	039153-0325	5742

7590 01/21/2004

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EXAMINER
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ROSASCO, STEPHEN D

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 01/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

10/047,610

Applicant(s)

BABCOCK ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 November 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-22 is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
 \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11/4/03.                      6) ☐ Other:

### **Detailed Action**

In response to the Amendment or 8/4/03, the examiner withdraws the rejection under 35 U.S.C. 102(b), maintains the rejection under 35 U.S.C. 103(a) over claims 1-14, indicates allowability of claims 15-22, and makes the action final.

REMARKS – The applicant argues that while Tanaka et al. does disclose opening patterns etched to different depths (see Figure 3E), it does not identically disclose a mask that includes trenches having different depths such that light of a first wavelength may be phase-shifted utilizing trenches) having a first depth and light of a second wavelength may be phase-shifted utilizing trenches) having a second depth.

The applicant also discusses the Pierrat et al. reference, with respect to the fact that the though the reference teaches the use of exposure with two different wavelengths it also teaches that the trenches are of the same depth. The applicant also cites a calculation from the reference to show that it is specific to a single trench depth. This reference was cited by the examiner, because it shows what is required to perform exposure with two different wavelengths using the same depth for a phase shifting trench. The prior art obviously shows the relationship between exposure wavelength and depth of trench. And that a second trench with a different depth can be used to make a relative phase shift between the first and second trench, analogous to the shift from the surface and a first trench depth; and that a mask with a trench designed for phase shifting can be used with two different wavelengths, if the wavelengths were selected appropriately.

The examiner maintains the rejection on the grounds that the prior art amply demonstrates all of the features of the claimed invention and there function in the mask art, that the prior art has shown the use of two different wavelengths of light together in the one mask

and that the use of a second trench for phase shifting a second wavelength of light is a repetition of the first trench for the same purpose.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pierrat et al. (6,068,951) or Ito et al. (5,700,605) in view of Tanaka et al. (5,549,995).

The claimed invention is directed to:

Claims 1-8, phase shifting mask comprising a transparent material having a plurality of first and second trenches which are a different depth.

Claims 9-14, wherein the trenches are produced by etching the substrate.

Claims 15-22, a method of testing the effect of lights having different wavelengths on a photoresist by transmitting light having a first wavelength through the first trenches and transmitting light having a second wavelength through the second trenches.

Pierrat et al. teach a phase shifting mask formed from a quartz substrate including a phase shifting layer etched into a surface of said substrate for shifting a first exposure light having a first wavelength about 180 degrees and shifting a second exposure light having a second wavelength about 180 degrees.

Ito et al. teach in a method for production of a mask for light exposure provided with a light transparent substrate and a mask pattern formed on the light transparent substrate, said

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mask pattern comprising a light screening pattern composed of a material which screens the exposure light and transmits the light having the longer wavelength than that of the exposure light and a phase shift pattern formed by engraving a part of the light transparent substrate, said process comprising calculating an etched depth of the light transparent substrate by determining the optical image of the light passing through the light screening pattern and the light passing through an opening of the light screening pattern or determining the phase difference between said two kinds of lights using the phase measuring light having the longer wavelength than that of the exposure light.

The teachings of Pierrat et al. or Ito et al. differ from those of the applicant in that the applicant teaches having a plurality of first and second trenches formed in the substrate, which are a different depth.

Tanaka et al. teach a method of manufacturing a transmitting photomask, includes a step of forming a plurality of transmitting portions including recesses having different depths alternately by etching the transparent substrate through the opening patterns by use of anisotropic etching.

It would have been obvious to one having ordinary skill in the art to take the teachings of Pierrat et al. or Ito et al. and combine them with the teachings of Tanaka et al. in order to make the claimed invention because it is well known in the phase shifting mask art that the depth of trench can be adjusted to transmit light that is shifted by a desired amount.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Rosasco whose telephone number is (703) 308-4402.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661. Fax (703) 872-9310 Before Finals; 872-9311 After Finals.

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized, elongated initial 'S'.

S. Rosasco  
Primary Examiner  
Art Unit 1756

S. Rosasco  
1/12/04